Sewage Rules Create Gap in Housing Supply in Massachusetts

A Report Prepared for the Massachusetts Housing Partnership

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The Gap in Housing Supply

It's a fairly simple problem in economics. The Commonwealth of Massachusetts has a bright regulatory threshold in dealing with the handling of on-site sewage treatment and disposal for residential development projects: 10,000 gallons per day. Sounds simple, but when examined more closely, being on either side of the threshold translates to hundreds of thousands of dollars in design, permitting construction and operation costs to projects. Projects above the threshold can only economically exist with numbers of units well above this bright line, resulting in a gap or a hole in projects sizes. Ever wonder why there are so many forty-four-unit condominium developments in the state? Read on to find out why.

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Introduction

It's no secret that Massachusetts needs to produce more housing to sustain its economy and to keep young professionals from moving elsewere. The Metropolitan Area Planning Council (MAPC) estimates we need produce 500,000 units between 2010 and 2040 just to maintain our existing base of employment and to compensate for more than a million Baby Boomers that will leave the work force. Producing housing at such an ambitious rate will have to include development in areas of eastern Massachusetts that do not have access to municipal sewer. Involvement of the private for-profit and not-for profit development communities will also be critical to building the housing we need.

Massachusetts regulates sewage treatment and disposal through regulations enacted by the Massachusetts Department of Environmental Protection (MassDEP) and administered and enforced through local city and town Boards of Health. Within this regulation is a sewage flow threshold, below which offers projects relatively simple systems to handle their sanitary waste. The problem is that this threshold is a hard or "bright" line, above which projects have to incur very expensive systems to permit and construct as well as operate and maintain. To absorb these high costs, projects must be large enough to spread both the initial and long-term costs over more residential units. A sizing gap therefore exists between projects that stay under the threshold and the larger projects. Many times suitable land exists that warrants a project size within the gap. Reduction below the threshold lead to economic infeasibility given Massachusetts' high cost of land. Larger projects either do not physically fit within the site or do not fit the character of the neighborhood. Many times projects proposed by not-for-profit organizations have funding requirements that demand they have a unit count right in the middle of this gap. The state's environmental regulators and housing advocates should come together to address this gap in an environmentally responsible and financially sound manner.

A peripheral but directly related issue involves municipalities enacting local sewage treatment and disposal regulations that are more stringent than the state requirements. These requirements are rarely backed by strong technical justification and only lead to drive project costs higher while providing suspect increased environmental and public health protections.

This reports looks to detail these issues with facts, figures and to offer the author's opinions formed over nearly 30 years in the business of the design, permitting and development of housing in Massachusetts.

Section 1

The Regulations

Title 5 - 310 CMR 15.000

The State Environmental Code (310 CMR 15.000), also known as Title 5, is the standard requirement for the siting, construction, inspection, upgrade and expansion of on-site sewage treatment and disposal systems. Essentially if one does not have access to a town sewer system, this regulation outlines what to do with what we put down our drains. The regulation covers what to do with sanitary waste from all types of uses, from commercial to industrial to residential. The state has determined that by following the requirements of Title 5 in the investigation of soil conditions, proper siting, adequate sizing of system components and minimum maintenance of those components, the environment is suitably protected from potential adverse impacts from discharging sanitary waste into the ground.

Since 1978, Title 5 has had several revisions, but the basic approach to the design and construction of these systems has not changed. As designers, we visit a site with a backhoe, dig a big hole to determine where seasonal high groundwater exists and to test how fast water travels through the soil (a percolation test), and then design the on-site sewage disposal system based on the anticipated daily flow. This flow is estimated using Title 5 design flows for various uses. In the case of a residential project, Title 5 requires systems to be designed forecasting 110 gallons per day (gpd) per bedroom. There are some that believe this quantity to be overly conservative. Adjustments have not been made over the years to consider the fact that the average family size in the U.S. has decreased from 3.06 persons in 1972 to 2.54 persons in 2013[2], or the fact that the use of water conserving plumbing fixtures and appliances has increased during the last twenty years. An old clothes washing machine used 40- 50 gallons per load; today's machines use as little as 17 gallons[3].

MassDEP convened a working group of regulators and industry experts in 2012 to discuss the issue of the appropriateness of Title 5 design flows. The group researched data from a variety of existing users as well as available data and requirements from other states. With regard to residential use, the group concluded that while 110 gallons per bedroom appears appropriate for a single-family home given the lack of control over the number of persons residing, but that the regulations offer no considerations for the economy of scale and statistical reductions in total flow realized in larger residential projects. The group reviewed actual flow data for 25 active private wastewater treatment facilities at condominiums and apartment communities ranging in size from 68 bedrooms to 712 bedrooms. The group observed the average flow per bedroom to be 68 gallons per day, with a low of 22 and a high of 114 gallons per bedroom per day.

Even very large Title 5 systems, while complex, are afforded the assumption that if designed and installed in accordance with the regulations, the system serves to protect the environment. While frequent and proper maintenance is a very good idea with all these systems, it is not required, monitored or tracked. Maintenance for on-site systems features pumping of septic tanks every one to three years. In accordance with Title 5,

[2] U.S. Census Date - www.census.gov

[3] www.home-water-works.org data related to water conservation.

systems must be inspected upon the sale of the property. These inspections are quite intense and often lead to the required replacement of failed systems.

Title 5 sets a limitation on the use of on-site sewage disposal systems at no more than 10,000 gallons per day. At 110 gallons per bedroom, this equates to 90 bedrooms. This is the reason there is an abnormally high number of 44-unit 2-bedroom condominium projects proposed in the state every year (88 x 110 = 9,680). Projects exceeding 10,000 gallons per day must provide treatment of wastewater prior to discharge to the ground through the construction of a private on-site wastewater treatment facility. These very expensive systems require constant oversight, sampling, monitoring and reporting to MassDEP. Plants must be inspected daily by a licensed plant operator. The plants are required to meet strict treatment requirements of the Massachusetts Groundwater Discharge Regulations (314 CMR 5.0). The required operation, monitoring and reporting result in a very high degree of control and insured environmental protection.

So let's go back to that 44-unit 2-bedroom condominium project with a 9,680-gallon-per-day sewage disposal system. The system is presumed to be protecting the environment with no insurance that maintenance is being done properly or at all. And since there is never a sale of the entire condominium development, there is no requirement to inspect the system. You might say there is a flaw in the Title 5 regulation and our state's environment is in peril. It is not the case. By all accounts, the Title 5 regulations are working. Old failing systems are being repaired, and the environment is being properly protected.

Groundwater Discharge Permit - 314 CMR 5.00

Now let's look at adding just three bedrooms to our forty-four-unit condominium project. The bedrooms add 330 gallons to the total, and we exceed the 10,000-gallon bright line. We now need a wastewater treatment plant. These systems require a Groundwater Discharge Permit in accordance with 314 CMR 5.00. The regulations govern wastewater treatment systems with design flows of 10,000 gallons per day or greater and are administered by MassDEP. The local Board of Health does not permit a system of this size. In some towns the local Board of Health have regulations governing these systems, but these regulations do not supersede the state regulations as they do with Title 5. MassDEP has sole permit-issuing authority.

The state-level regulations require significant analysis of a proposed discharge site to ensure the treated effluent will not create a public health or environmental nuisance in the future. This includes testing the suitability of subsurface soils, mapping groundwater flow, and identifying downgradient impacts, including the cumulative impacts to drinking water supplies and coastal embayments. They also require an applicant to submit a fully engineered design for the disposal facility and an engineering report describing the overall design of the treatment facilities. Treatment plant designs must comply with MassDEP's Guidelines for the Design, Construction, Operation, and Maintenance of Small Wastewater Treatment Facilities with Land Disposal (MassDEP publication, April 2004). The leaching field area requirements for wastewater treatment plants is

significantly less compared to Title 5 systems due to the higher treatment. With good soils, the loading rate can be up to six times faster than that for a Title 5 system, requiring significantly less land for the disposal facility.

The design of these systems include a complex hydrologic analysis that has to consider how the effluent from the plant will affect down gradient wells. A treatment plant discharge must be separated from a public supply well by a distance equal to a two-year time of travel for groundwater. For example, if groundwater is moving at an average speed of one foot per day (typical of sandy soils), a treatment plant discharge must be a minimum of 730 feet from the well. A 730-foot radius around a well is 38 acres of land. This obviously can have a dramatic impact on housing projects needing both a wastewater treatment facility and a well, requiring substantially more land.

Stepping over the bright line of 10,000 gallons per day, we now have an exponential increase in environmental protection and ironclad insurance that the system continues to function providing the required treatment. The system is inspected daily, effluent sampled and analyzed and reports sent to MassDEP. Sounds expensive? It is. We will explore costs later in the report, but it's safe to say that the revenue from the extra three bedrooms will not cover the cost.

Local Regulations

The Massachusetts Home Rule Amendment (Article 89) and a state statute known as the Home Rule Procedures Act.2 (MGL Ch. 43B) were adopted in 1966. The purpose of the Home Rule Amendment is, by its own terms, to "grant and confirm to the people of every city and town the right of self-governance in local matters."

Municipalities are allowed to adopt regulations under Home Rule that are more stringent than state regulations. In the case of on-site sewage disposal, many communities have adopted local septic regulations. The Pioneer Institute and Rappaport Institute studied 187 communities within 50 miles of Boston in 2005. There are 109 communities that have local septic regulations beyond those in Title 5. Increasing the depth to groundwater for leaching fields, increasing design flow above 110 gallons per day per bedroom, and increasing setbacks of systems to property lines, wells and wetlands are just a few of the features of these local rules that make it harder and more expensive to install conventional or shared systems. Thirty of the communities studied have some additional restrictions or outright prohibitions on the use of shared systems.[4]

The Comprehensive Permit Law (MGL CH 40B) does allow developments including affordable housing to seek waivers from these local rules. A disproportionate share of multi-family housing being built in Massachusetts' suburban communities are utilizing Chapter 40B since by-right multi-family housing is almost non-existent in the Commonwealth, due to either zoning constraints or the availability of adequate lands zoned for multi-family.

[4] Residential Land-Use Regulation in Eastern Massachusetts, Amy Dain Pioneer Institute, December 2005

Section 2

The Costs

The cost of an on-site sewage disposal system designed in accordance with Title 5 can vary widely depending on system design flow and soil conditions at a particular site. If we focus on larger multi-family residential systems with design flows approaching the 10,000 gallon limit, cost variation seem to narrow. Actual construction costs have been gathered for several systems installed within Massachusetts over the past several years are presented in Table 1.

Table 1 On-site Sewage Disposal System Construction Costs

Town	Project	No. of Bedrooms	Design Flow gpd	System Cost	Cost per Bedroom
Oxford	Pinewood on the Green	46	5060	$160,000	$3,478.00
Littleton	Littleton Ridge	54	5090	$200,000	$3703.00
Sudbury	Coolidge at Sudbury	67	7370	$220,000	$3,283.00
Wayland	89 Oxbow[5]	37	4070	$182,500	$4,932.00

The costs associated with operation and maintenance of sewage disposal systems are directly related to design flow as the major cost item is septage hauling and disposal costs from the required septic tank pumping. Actual maintenance costs for several large systems are presented in Table 2.

Table 2 On-site Sewage Disposal System Maintenance Costs

Town	Project	No. of Bedrooms	Design Flow gpd	Annual Budget	Cost per Bedroom
Oxford	Pinewood on the Green	46	5060	$3,700	$81.00
Littleton	Littleton Ridge	54	5090	$4,900	$91.00
Sudbury	Coolidge at Sudbury	67	7370	$4,500	$67.00
Wayland	89 Oxbow[6]	37	4070	$5,000	$135.00

Wastewater treatment facility costs are primarily driven by the cost of the actual treatment apparatus. Various types of treatment package treatment plants are available and have been proven to effectively meet the treatment requirements of 314 CMR 5.00. In the past several years MassDEP has recommended the use of membrane bioreactor systems that rely on microorganisms suspended in the wastewater to treat it. Other options include, activated sludge and anaerobic digestion.

[5] 89 Oxbow project included a recirculating sand filter due to being within a wellhead protection area.
[6] 89 Oxbow project included a recirculating sand filter due to being within a wellhead protection area.

Generally all the treatment options that are approved for use with have pricing driven by market competition and will be somewhat similar. Full systems start at $1 million and run up to $2 million for very large private systems. Effluent (leach) fields for disposal of treated wastewater are not required to be as large as those for Title 5 systems but due to large flows involved still come at a substantial cost. Operation and maintenance for these facilities generally exceed $100,000 for any facility given the need for the systems to be monitored daily by a licensed wastewater treatment facility operator, energy costs and required continual funding of an escrow account required by MassDEP to make large repairs and replacement of system components.

Tables 3 and 4 below are some examples of system construction costs and also annual operation budgets.

Table 3 Wastewater Treatment Facility Construction Costs

Town	Project	No. of Bedrooms	Design Flow gpd	System Cost	Cost per Bedroom
Westford	Graniteville Woods	396	43,560	$1.8M	$4,545.00
Littleton	Village Green	498	55,000	$1.75M	$3,514.00
Westford	Princeton	352	39,000	$1.6M	$4,545
Sterling	Choksett Crossing	90	9,900	$1.1M	$12,200
Holliston	Crest View	118	13,000	$1.2M	$10,170
Westport	Edgewater	72	11,000	$1.1 M[7]	$15,277

As you can see the larger the system the closer cost per bedroom begins to approach the cost for large septic systems.

Table 4 Wastewater Treatment Facilities Maintenance Costs

Town	Project	No. of Bedrooms	Design Flow gpd	Annual Budget	Cost per Bedroom
Westford	Graniteville Woods	396	43,560	$125,000	$315.00
Littleton	Village Green	498	55,000	$125,000	$251.00
Westford	Princeton	352	39,000	$115,000	$326.00
Sterling	Choksett Crossing	90	9,900	$102,000	$1,133.00
Holliston	Crest View	118	13,000	$100,000	$847.00
Westport	Edgewater	72	11,000	$125,000	$1,500.00

[7] The actual Edgewater system cost of $900,000 has been converted to present day worth for comparison given the system was constructed 12 years ago.

However operation costs are 10 to 15 times that of conventional septic systems. These costs put an incredible strain on condominium associations in particular. In the case of Choksett Crossing MassDEP is working with the association to reclassify the system as a Title 5 system to reduce annual operation costs seeing that the system has a design flow below the 10,000 gallons per day. The project was originally proposed with a wastewater treatment facility to mitigate nitrogen impacts to a sensitive area.[8]

One of the other smallest projects is the 72-unit age restricted Edgewater Apartments in Westport. This project was permitted using 150 gallons per apartment unit for age restricted housing in accordance with Title 5. Completed in late 2002, the project implemented an Enviroquip® MBR (membrane bioreactor) technology for the wastewater treatment. This 11,000 gpd system was completely constructed underground with additional equipment housed in the apartment building's basement.[9] The initial cost of the system installation was $900,000 and annual operation runs $120,000. This translates to a very high $12,500 per unit in construction cost and $1,200 per bedroom in annual operating costs. Compare this to the Title 5 system installed at the Coolidge at Sudbury. This 67-unit age restricted project has only five fewer units and designed using only 110 gallons per day per bedroom under the residential flow. This approach was allowed by the local Board of Health. MassDEP has recently revised Title 5 in the 2014 to recognize design flow of 110 gallons per day for one-bedroom senior housing. Prior to this, MassDEP did not formally recognize the one bedroom housing for the elderly requiring all units to use 150 gallons per day regardless of the number of bedrooms. The Coolidge's system features a conventional septic tank and leach field implementing a Presby© system for the leach field. Due to site grades, the system does require a pump chamber. The cost for this system however was only $220,000 or $3,200 per unit almost one quarter the price. The operating cost here is only $81.00 per unit compared to $1,200 at Edgewater, almost 15 times the cost.

Initial construction costs become appear to be feasible for projects with more than 200 bedrooms. Operation costs are comparatively very high in all cases. The financial feasibility of absorbing these annual expenses seem to require more than 300 bedrooms within a project.

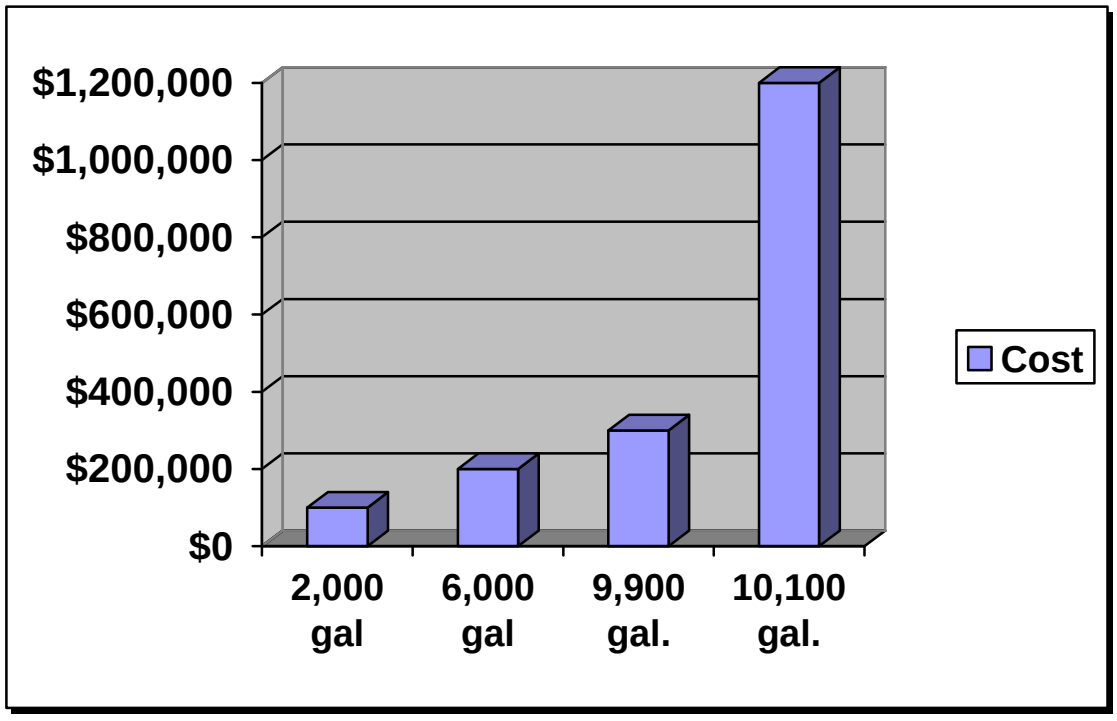
MassDEP provided a similar comparison within their Smart Growth/Smart Energy Series web page. MassDEP makes the argument in the Table 5 below that the increased density of multi-family project justifies the cost. If we assume two-bedroom units, their numbers do not seem to correlate to those gathered in preparation of this report. MassDEP provides further justification based on the cost of land per unit based on the cost of land. The argument fails to address the simple fact that projects having between 90 and 300 units are not economically feasible.

[8] Information regarding Choksett Crossing provided by Counsel for the Association.
[9] Ovio (GLV, Inc.) Project Highlight Sheet – Edgewater Apartments – www.mbrcentral.com

Table 5
Wastewater Construction Costs for Different Approaches and Densities[10]

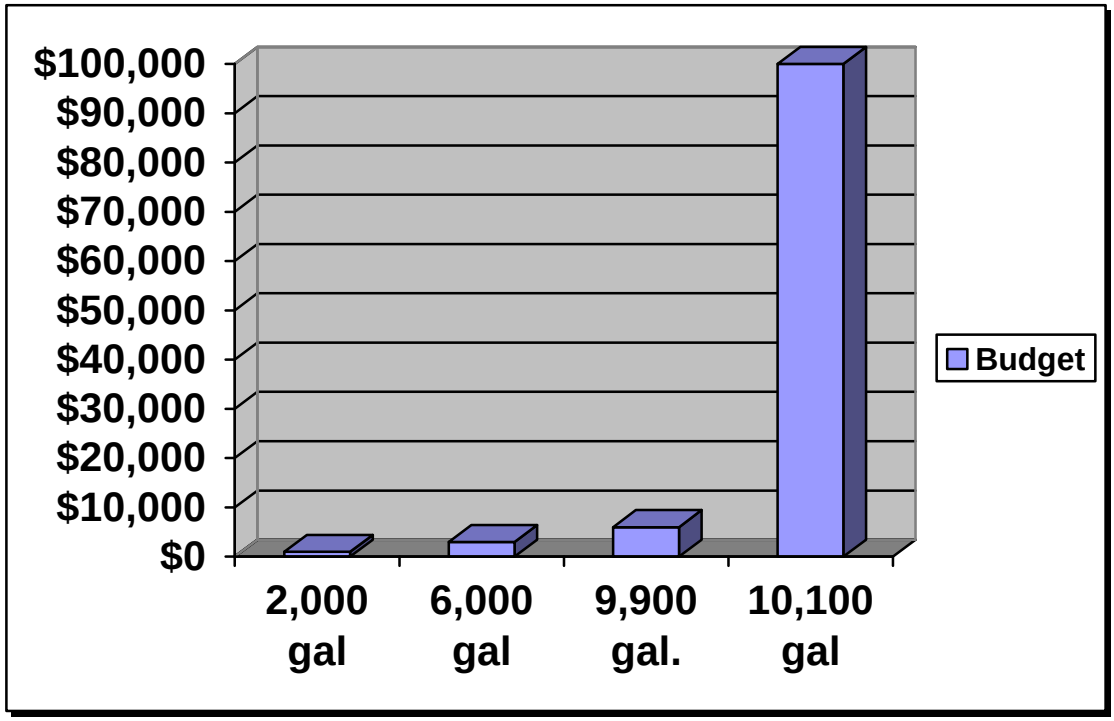
	Title 5	I&A	Centralized Sewage Treatment
Sewage Cost	$7,500/Unit	$15,500/Unit	$45,000/Unit
Density (units/acre)	1	1.5	8
Land & Sewage Cost/Unit ($)			
For land costing $50,000/acre	$57,500	$43,667	$11,875
For land costing $100,000/acre	$107,500	$82,167	$57,500
For land costing $200,000/acre	$207,500	$148,833	$70,000
For land costing $300,000/acre	$307,500	$215,500	$82,500

Figure 1 Wastewater Systems Construction Costs



[10] Table taken from MassDEP Smart Growth/Smart Energy Toolkit Wastewater Alternatives

Figure 2 Wastewater Operation and Maintenance Annual Budget



Section 3

The Numbers

There are approximately 63 active residential wastewater treatment facilities in Massachusetts. The regulation require continual monitoring and reporting of data from these facilities. The information reported includes both original design flow as well as actual flows leaving the facilities on a daily basis.

Of the 63 active residential wastewater treatment facilities reviewed the average design flow is 43,000 gallons per day corresponding to an average number of bedrooms of 393. Only eight or 13 percent of the total residential facilities reviewed had fewer than 200 bedrooms. The largest system has over 200,000 gallons per day and the smallest is just over 7,000 gallons per day. This smallest facility and one other with flow under the threshold are special cases where facilities are treating wastewater in accordance with MassDEP Groundwater Discharge Permit Regulations while being below 10,000 gallons per day. Choksett Commons in Sterling was discussed earlier in this report, the other is Brookside Mills in Westford. Brookside took advantage of the leaching requirement reduction a wastewater treatment facility offers to increase the yield on a tight environmental sensitive site. According to the Westford Board of Health Agent, Brookside has had continual problems leading to very expensive operating costs per unit. Representatives could not be reached to report actual costs.

One of the other smaller project is the 72-unit Edgewater Apartments in Westport discussed earlier. These small projects appear to be unique anomalies and should be discounted from a global analysis of project feasibility.

Anecdotally, the development community has avoided wastewater treatment as well as public water supplies unless project numbers are at 100 to 150 units or 200-300 bedrooms as the cost number presented in this report support. In some cases projects have been divided to avoid these systems. This practice is closely scrutinized by MassDEP and communities. The regulations do not allow such division for the sake of regulatory avoidance. MassDEP requires that projects are clearly separate and distinct having separate and distinct ownership separation and funding sources. Examples have included singly permitted condominium projects being split having totally separate legal condominium associations with independent board of trustees. This practice only serves to increase costs to home owners and increase the complexity of permitting and oversight.

The Coolidge at Sudbury and Edgewater Senior Apartments comparison shows that small variations in numbers with regard to project size and design flow applied can make extreme differences in projects cost and economic feasibility.

Table 6 Design Flow Data[11]

FACILITY NAME	TOWN	Type	DESIGN FLOW
BUCK ISLAND CONDO	YARMOUTH	R	30,000
LINCOLN HOMES	LINCOLN	R	26,000
GREENBRIAR ESTATES CONDO	NORTH READING	R	40,000
SEACREST CONDO ASSOC	FALMOUTH	R	85,000
HILDRETH HILLS CONDO.	WESTFORD	R	44,700
FARMBROOK CONDO.	ACTON	R	105,000
COLONIAL DRIVE CONDO.	ANDOVER	R	33,110
FRIENDS CROSSING CONDO.	EASTON	R	31,000
PARK COLONY CONDOS.	NORTH READING	R	26,000
SUMMER HILL CONDO.	PLYMOUTH	R	48,970
FULLER POND VILLAGE	MIDDLETON	R	48,000
WHITE CLIFFS CONDO.	PLYMOUTH	R	80,000
GREAT ROAD CONDOMINIUMS	ACTON	R	27,720
ACORN PARK CONDO. TRUST	ACTON	R	39,750
OCEAN POINT CONDOS.	PLYMOUTH	R	30,000
MAYFLOWER PLACE	YARMOUTH	R	25,000
LAKESHORE VIL/WOODLANDS	LUNENBURG	R	12500
HITCHIN' POST GREENS CONDO	WESTFORD	R	80,500
WEDGEWOOD CONDOMINIUMS	SOUTHBOROUGH	R	31,680
THE VILLAGES AT DUXBURY	DUXBURY	R	54,000
PONDSIDE APARTMENTS	LITTLETON	R	23,130
ORCHARD HILL ESTATES	OXFORD	R	45,000
MACINTOSH FARM COMMUNITY	SHARON	R	35,000
HILLS @ MAINSTONE CONDO.	WAYLAND	R	36,000
NASHOBA VIEW II	WESTFORD	R	39,900
TRADITIONS WWTF	WAYLAND	R	27,120
MEADOWS @ MAINSTONE FARM	WAYLAND	R	24,640
BROOK VILLAGE CONDO.	BOXBOROUGH	R	33,000
ACTON RETIREMENT COMMUNITY	ACTON	R	34,520
PINEHILLS LLC WWTF	PLYMOUTH	R	215,000
ROLLING PINES CONDOMINIUMS	EASTON	R	36,000
BOXBOROUGH MEADOWS	BOXBOROUGH	R	158,420
MEETING HOUSE AT STOW	STOW	R	120,000
VILLAGE AT STONE RIDGE	WESTFORD	R	25,000
EDGEWATER APARTMENTS, LLC	WESTPORT	R	11000
BROOKSIDE MILL CONDOMINIUM	WESTFORD	R	7,480
HARVARD RIDGE CONDO. TRUST	BOXBOROUGH	R	33,130

[11] Data obtained from MassDEP PWWTF Database. Note: Facilities with design flows greater than 150 gallons per day per bedroom were omitted as not representative of a standard residential design flow.

VILLAGE @ FLATHILL	LUNENBURG	R	14850
THE JEFFERSON	BELLINGHAM	R	54,000
MILL POND VILLAGES	YARMOUTH	R	44,800
HARMONY CROSSING	EAST BRIDGEWATER	R	22,000
WHITE PINE VILLAGE	EAST BRIDGEWATER	R	25,000
CRESTVIEW CONDOMINIUM	HOLLISTON	R	13000
STOW VILLAGES, LLC	STOW	R	34,000
LAUREL HILL	WESTFORD	R	96,000
VILLAGES AT RIVERS EDGE	NORFOLK	R	32,000
CHOCKSETT CROSSING	STERLING	R	9,900
SUMMER VILLAGE	WESTFORD	R	68,000
ABBOTT MILL	WESTFROD	R	21560
AVALON COHASSET	COHASET	R	33,500
WAYSIDE FARM	EAST BRIDGEWATER	R	22,000
THE PRESERVE AT OAK HILL	WRENTHAM	R	27,280
SPRING HILL COMMONS APTS.	ACTON	R	20,570
EDGEWOOD LUXARY APART.	NORTH READING	R	63,240
CODMAN HILL CONDOMINIUM	BOXBOROUGH	R	19800
RESIDENCES AT CANAL BLUFFS	BOURNE	R	31,994
SAWYER HILL HOUSING	BERLIN	R	21,600
WILBER SCHOOL APARTMENTS	SHARON	R	18150
GRANBY HEIGHTS CONDOS	GRANBY	R	17600
CONCORD MEWS	CONCORD	R	66,000
THE VILLAGES AT MARSHFIELD	MARSHFIELD	R	57,310
GRANITEVILLE WOODS	WESTFORD	R	43,560
AVERAGE			**43,242**
AVERAGE NUMBER OF BEDROOMS (assumes 100 per)			**393**
MAXIMUM			215,000
MINIMUM			7,480

Actual flow data was gathered for some of the residential wastewater treatment facilities and is presented in Table 7 below shows actual flows per bedroom to be much less than Title 5 required design flow of 110 gallons per day.

Table 7 Actual Flow Data[12]

Project	Town	Total Bedrooms	Average Flow per Bedroom
Acorn Park	Acton	648	34
Great Pond	Acton	506	46
Spring Hill Commons	Acton	187	46
Colonial Drive	Andover	301	76
Longview	Bellingham	500	22
Harvard Ridge	Boxborough	271	41
Yule Properties	Easton	332	91
Crest View	Holliston	118	105
Indian Brook	Hopkinton	223	52
Lincoln Homes	Lincoln	220	79
Pondside	Littleton	183	91
Village at Flat Hill	Lunenburg	137	109
Stafford Pond	Mashpee	305	57
Windchime Point	Mashpee	314	114
Fuller Pond Village	Middleton	425	100
Greenbrier Estates	North Reading	279	64
Park Colony	North Reading	257	91
Orchard Hill	Oxford	407	86
Pembroke Woods	Pembroke	390	76
White Cliffs	Plymouth	712	27
Wedgewood	Southborough	240	48
Choksett Crossing	Sterling	90	56
Brookside Mill	Westford	68	73
Hitching Post Green	Westford	608	46
Village at Stone Ridge	Westford	217	80
Edgewater Apartments	Westport	100	67
Average			**68.3**
Minimum			**22**
Maximum			**114**

[12] Data obtained from MassDEP PWWTF Database. Note: Facilities with design flows greater than 150 gallons per day per bedroom were omitted as not representative of a standard residential design flow.

Local Board of Health regulations can increase Title 5 design flow. Several towns have increased the minimum to 165 gallons per bedroom. The actual flows shown here reflect an economy of scale and statistical averaging of individual home maximums within a multi-family community having a shared wastewater treatment facility and/or community well. These numbers further support the lack in justification for this type of local increased regulation.

Section 4

Other States

Each state has a unique set of rules to regulate the installation and maintenance of on-site wastewater treatment systems. These rules can cover the gamut of regulation: some states set a very low regulatory threshold, while others use an alternative means to properly design an effective treatment system. Let's look at a few of these states and see how they compare to Massachusetts.

Wisconsin
Wisconsin has a design flow limit of 12,000 gallons per day before a state-issued pollutant discharge elimination system permit must be obtained. The state uses a peak flow of 150 gpd per bedroom, which results in 80 bedrooms at the threshold. However, Wisconsin code states that "12,000 gpd shall be deemed equivalent to 85 bedrooms for residential dwellings."[13] Despite this five-bedroom increase, the state faces a gap in development sizes much like Massachusetts.

Indiana
Indiana has set a threshold of 750 gpd, which equates to a five-bedroom home. Any development above this limit is considered a commercial on-site sewage system and is subject to additional permits and monitoring systems. Indiana allows a decrease in the absorption area if secondary treatment is used.

Maine
Maine has one of the simplest set of regulations to follow. Their basic rule is that any system can be proposed for any sized development "as long as it works."[14] If the design flow exceeds 2,000 gpd, it must be designed by a licensed engineer. Towns are allowed to place more stringent regulations.

Arizona
Arizona uses two thresholds to determine the level of treatment, permitting and monitoring required. A relatively simple treatment facility is allowed for design flows under 3,000 gpd, while a more-regulated system is required for flows up to 24,000 gpd. Beyond that, an Individual Aquifer Protection Permit is required.

Pennsylvania
Pennsylvania, like Massachusetts, has a design limit of 10,000 gpd. Clustered systems are allowed, and local municipalities cannot create stricter regulations. Pennsylvania does not allow any provisions for increased flow.

New Hampshire
New Hampshire controls the size and household density of their developments by using a lot loading capacity (2,000 gpd per acre) instead of a cumulative flow threshold. This allows developers to design a series of simple wastewater systems to treat a large

[13] Wisconsin Administrative Code SPS 383.22(2)(b)6.b.
[14] Glenn Angell, State Site Evaluator, Maine Department of Health and Human Services

subdivision, as long as there is enough land. New Hampshire does, however, require a groundwater discharge permit for design flows above 20,000 gpd.

A few states have similar regulations to Massachusetts and find themselves with a similar financially-inspired gap in development sizes. But, most states have avoided that gap by allowing a higher threshold or by using another appropriate measuring stick. MassDEP can learn from the successes of those states and do away with sizing gap while maintaining a leading environmental standard.

Section 5

Recommendations – A Middle Ground

It is clear from the information presented herein that an extreme difference in cost exists on either side of the regulatory threshold contained within Title 5. The public health and environmental protections afforded through more intense analysis, higher technical requirements for treatment and extremely higher levels of operation, monitoring and oversight that are necessary for these complex systems seem extreme when observed from the perspective of those projects just under the thresholds. Below are a few recommendations to avoid the gap.

1. Implement a framework of analysis, design and oversight that provides adequate public health and environmental protections while being sensitive to the financial feasibility of projects between 10,000 and 20,000 gallons per day. Implementation of primary treatment with a focus on water quality at the property line or limit of a sensitive receptor rather than at the outlet of the treatment device and a relaxation of the inspection and operation requirements from daily to monthly or even quarterly could result in substantial savings. Remote monitoring could also be implemented, where operators would be alerted if system issues arise. These requirements could even be applied to very large systems below 10,000 gallons in situations that warrant providing protection that does not now exist. See Section 6 for a suggested regulatory change that might be considered.

2. Raise the 10,000-gallon-per-day (GPD) maximum design flow of a Title 5 system to 15,000 GPD in Section 15.004 (c). The original version of Title 5 in 1978 had the maximum at 15,000. It was changed in the 1986 revision to the regulations.

   310 CMR 15.004(1) The Approving Authority shall not approve the construction, upgrade, or expansion of an on-site subsurface sewage disposal system unless it is: (a) a system serving or designed to receive only sanitary sewage from a facility where the total design flow generated on the facility, is less than 15,000 gallons per day;

3. Include a graduated design flow rate for multi-family projects based on the total number of bedrooms in Section 15.203. This recommendation could be implemented alongside the ones listed above. Based on the data review by the MassDEP working group in 2012, the following could be supported:

Number of Bedrooms	Recommended Design Flow	Maximum Flow
1-18	110 GPD	1,980 GPD
19-48	95 GPD	4,560 GPD
49-90	85 GPD	7,650 GPD
91-200	75 GPD	15,000 GPD

4. Have MassDEP provide definitive guidelines to local Boards of Health for the implementation of local septic regulations and a process for review of these regulations to ensure compliance with the intent and purpose of Title 5. The Department can verify the scientific support for local requirements exceeding those in Title 5. MassDEP offers model regulations for local well regulations, but currently offers no guidance for local septic regulations. Since this proposal impacts rights granted to cities and towns by the legislature per The Massachusetts Home Rule Amendment (Article 89) and a state statute known as the Home Rule Procedures Act.2 (MGL Ch. 43B) that were adopted in 1966, we will leave it up to the lawyers to craft appropriate statutory and/or regulatory revisions to address this recommendation.

Section 6

Another Suggested Regulatory Change – Recirculating Sand Filters

On September 9, 2008, MassDEP issued a Certification for General Use for recirculating sand filters (RSF) in accordance with Title 5. The certification details the applicability, design criteria and monitoring regulations for an RSF system, that is, an on-site sewage disposal system that includes an RSF.

A recirculating sand filter significantly reduces the levels of Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), and total nitrogen in the wastewater effluent. Currently, an RSF system is recommended for developments in a Nitrogen Sensitive Areas (NSA), like Interim Wellhead Protection Areas and Zone II areas. Like any system under Title 5, the design flow must be under 10,000 gallons per day. With an RSF system, the regulations allow a 50% reduction in the soil absorption system if the flow is less than 2,000 gallons per day (there is no such reduction for flows between 2,000 and 10,000 gallons per day). Title 5 also allows a loading rate increase in an NSA from 440 to 550 gallons per day per acre.

Given the effectiveness of the recirculating sand filters, why not expand the applicability of an RSF system? MassDEP can stipulate that the use of an RSF system in a non-nitrogen sensitive will increase the design flow up to 20,000 gallons per day. Operators can follow the monitoring schedule stated in the certification, as opposed to the daily inspections and monitoring required for a wastewater treatment facility.

310 CMR 15 could be revised in Section 15.202 with the addition of subsection (4) as follows:
(4) A recirculating sand filter ("RSF") or equivalent alternative technology approved by the Department in accordance with 310 CMR 15.280 through 15.288 may be used as component of all systems designed to serve a facility or facilities with a design flow of 10,000 to 20,000 gpd when the subject site is ***not*** *located in a Nitrogen Sensitive Area.*

The use of a successful alternative technology like the recirculating sand filter to increase the design flow for on-site disposal systems would immediately remove the sizing gap that Massachusetts encounters. This regulatory change can be combined with the recommendations in Section 5, to provide developers an even greater ability to maximize developments while maintaining superior water quality standards.

Section 7

Conclusion

It is clear there is a point of economic feasibility when looking at what the residential development community has built over the last 20 years in the Commonwealth under current regulations. Regulations should allow for a full range of project sizes while protecting the public health and the environment. A gap exists caused by a combination of regulatory and financial factors in the Commonwealth between 90 and 200 bedrooms.

MassDEP should investigate the matter and provide opportunities across the full range of project types and sizes. Developable land in Eastern Massachusetts is scarce and expensive, and the development community can ill afford to waste land or miss chances to provide housing in order to meet the current and future needs of our citizens.

References

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6. Analysis of Impediments to Fair Housing Choice – Access to Opportunity in the Commonwealth.

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8. Ground Water Discharge Permit Program, 314 CMR 5.00

9. MassDEP Guidelines for the Design, Construction, Operation, and Maintenance of Small Wastewater Treatment Facilities with Land Disposal, 2004

10. Certification for General Use, Generic – Recirculating Sand Filter, September 9, 2008